DOCUMENT RESUME

ED 368 420 JC 940 225

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TITLE A New Direction for Developmental Education Using Technology.
PUB DATE Apr 94
NOTE 11p.; Paper presented at the Annual Convention of the American Association of Community Colleges (74th, Washington, DC, April 6-9, 1994).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Community Colleges; *Computer Managed Instruction; *Computer Networks; *Computer Software Development; Computer Software Evaluation; *Computer System Design; Cooperative Programs; Educational Assessment; *Management Information Systems; Program Development; *Remedial Programs; Two Year Colleges
IDENTIFIERS *Project SYNERGY

ABSTRACT

In January 1990, project SYNERGY was launched by 19 two-year colleges and 3 four-year colleges coordinated by Miami-Dade Community College, in Florida, with support from IBM and Title III funds. The project was designed to review and compile lists of useful instructional software for basic skill remediation and develop an integrated, adaptive, computerized management system. Under the project, faculty across the nation have reviewed 298 software packages to date in reading, writing, math, English as a Second Language, and study skills. This data is being used to develop the Project SYNERGY Integrator (PSI), an adaptive management system using Novell Netware. PSI provides standard faculty and student interfaces incorporating learning objectives, mastery test questions, and installation options to include multi-vendor software for assessment and instruction. Specific modules of the PSI include the PSI Access Module (PAM) in which students receive curriculum plans created from results on placement and diagnostic tests; the PSI Command Module (PCM) allowing faculty to select tests, add or delete students in his/her courses, and access student records and curriculum plans; and the Software Connectivity Module which communicates between various software programs. The PAM and PCM also feature e-mail communication between faculty and students. To maximize the PSI's benefits, institutions should provide appropriate faculty development activities; make an ongoing commitment to research in the use and production of software; and reexamine the physical, social, and cultural aspects of the institutional environment. (KP)

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A New Direction for Developmental Education Using Technology

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Project Director

at the

AACC ANNUAL CONVENTION
APRIL 1994

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Description of Project SYNERGY

Project SYNERGY was launched in January 1990. It represents a determined and concerted effort of nineteen two-year colleges and three four-year colleges coordinated by Miami-Dade Community College under the auspices of the League for Innovation in the Community College. Project SYNERGY I (January 1990 - December 1991), supported by a $1.3-million grant from IBM, focused on reviewing and compiling a list of useful instructional software for basic skills remediation; Project SYNERGY II (January 1992 - June 1994), also supported by IBM with another $1.3-million grant, continues software review and focuses on software implementation and research; Project SYNERGY III (October 1992 - September 1997) is a $2.3-million Title III grant to Miami-Dade Community College to develop an integrated, adaptive, computerized management system that will help institutions take a holistic approach in establishing *Learning Environment 2000 for Underprepared College Students.*

Looking back at the origins and progress of Project SYNERGY, we see that its success is mostly attributed to three phenomena:

- grassroots involvement of faculty who teach underprepared college students.
- working at one thing at a time as if the project were a jigsaw puzzle.
- seizing the windows of opportunity along the way.

As of April 1994, faculty across the nation have completed 491 reviews of 298 software packages in reading, writing, math, ESL, and study skills/critical thinking. The review results are available in the form of a database called PS^3 (Project SYNERGY Software Selector).

Closely corresponding to the learning objectives evaluated in the software review process is the activity through which faculty from SYNERGY colleges, with the assistance of a computerized tracking system, are writing questions in order to create a computerized bank of questions to test for mastery. As of April 1994, 39 faculty in four institutions have been involved in software implementation and research. While they have used a variety of software, research is the common thread that runs across the efforts of all institutions. We are currently developing Project SYNERGY Integrator (PSI), an adaptive management system for Local Area Networks using Novell Netware.

Emerging from the experiences of Project SYNERGY is the realization of a new direction for developmental education using technology. This direction consists of five components, four of which I consider as pillars and the fifth one as the foundation on which the pillars stand. The

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pillars are PSI, Software Implementation Model, faculty development, and research; the foundation is the institutional environment.

PROJECT SYNERGY INTEGRATOR (PSI)

PSI is designed to provide, on the one hand, a system that has standard faculty and student interfaces and, on the other, a platform of neutrality to accommodate multi-vendor software without affecting the standard user interfaces. It incorporates Project SYNERGY *learning objectives* and *mastery test questions* and provides *installation options* to include multi-vendor software for *assessment* and *instruction*. It provides *linkages* among learning objectives, instructional software, and mastery tests in order for the student to have smooth transitions from one learning objective to another and from one software package to another. It is designed, however, to let the faculty *indicate their preferences as to how PSI should manage their courses* and to give them *up-to-date information on how their students are progressing* and *take appropriate action*. Over *400 faculty and administrators* at two- and four-year institutions have been involved in specifying the necessary features and functions of PSI. Examples of how a faculty member and his/her student might interact with PSI are illustrated in Figures 1a. and 1b. Of particular significance to the new direction and the connectivity modules included in PSI and, hence, will be described here.

PSI Access Module (PAM). PSI responds to students through the *PSI Access Module* (PAM) in such a way that they feel they are at the center of the system when they are using it. PAM gets its instructions from the *Learning Guide*, which is the manager of student activity in PSI, and it constructs *Curriculum Plan(s)* for each student. A student enrolled in multiple courses will have multiple curriculum plans that will be available to him/her at sign-on. The *Learning Guide* automatically creates a *Curriculum Plan* for a student based on the results of placement and diagnostic tests. It selects the objectives to be mastered from the objectives database; having selected the objectives, it selects a list of appropriate software for instruction; and it further generates periodic tests from Banque to assess the student's mastery of objectives. This automatic process may be modified by faculty according to their preferences.

The student may ask for help at any time. The student can send E-mail messages to faculty/staff and receive responses on-line. The student can request that the faculty adjust the *Curriculum Plan* if he/she is having difficulty. In addition we have included in our design multi-student interaction from one terminal to accommodate collaborative learning.

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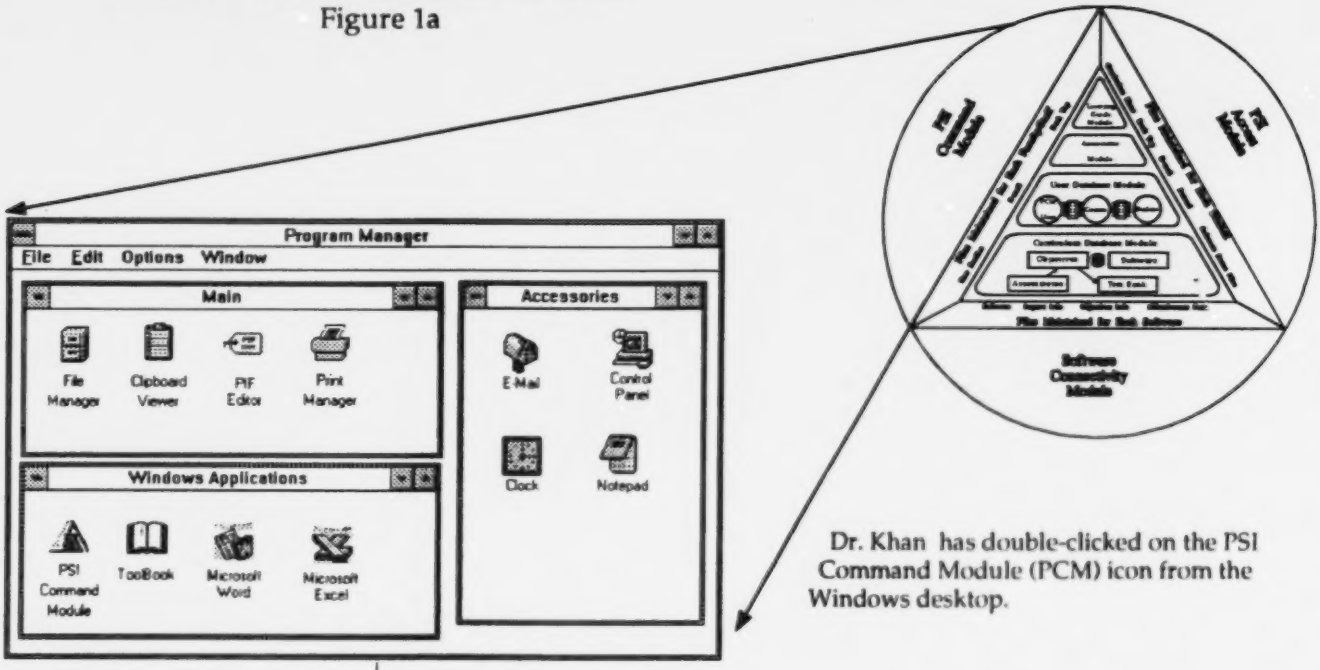
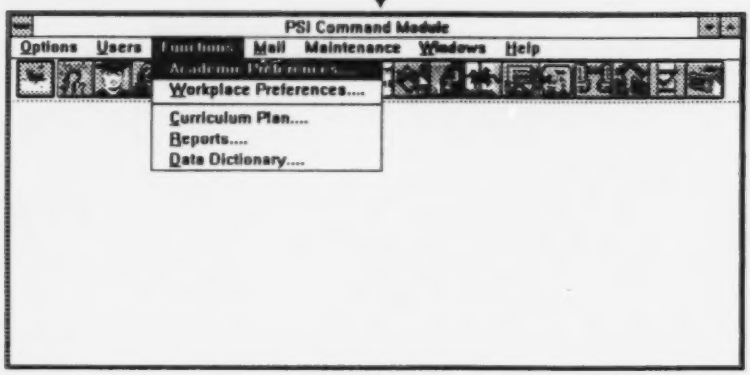
PSI Command Module (PCM)

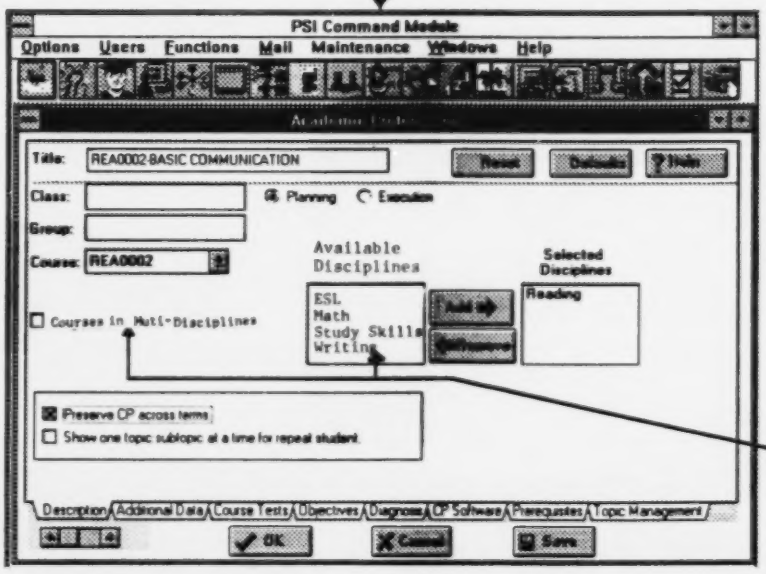
Figure 1a



Dr. Khan has double-clicked on the PSI Command Module (PCM) icon from the Windows desktop.



Dr. Khan selects Academic Preferences from the pull-down menu of *Functions* shown on the PCM desktop.



When Dr. Khan selects *Description* from the Tab Control, the options appear on the page. The Title has been entered and this course is to be single-discipline.

These options are grayed since the course is single-discipline.

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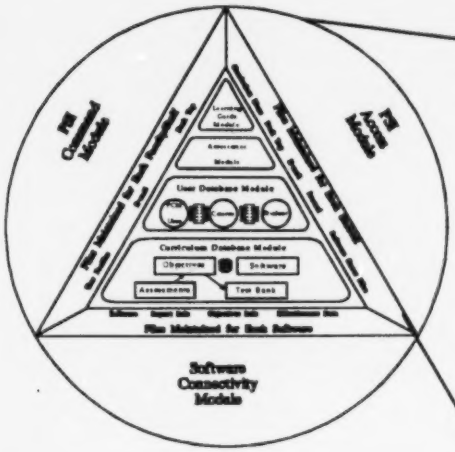
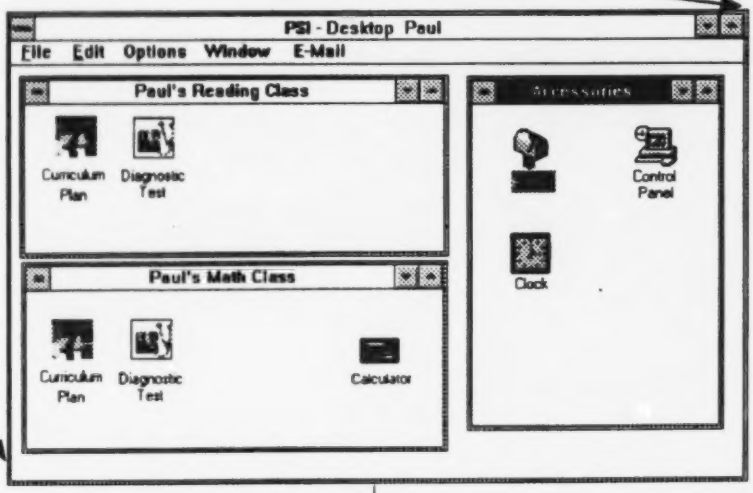
PSI Access Module (PAM)

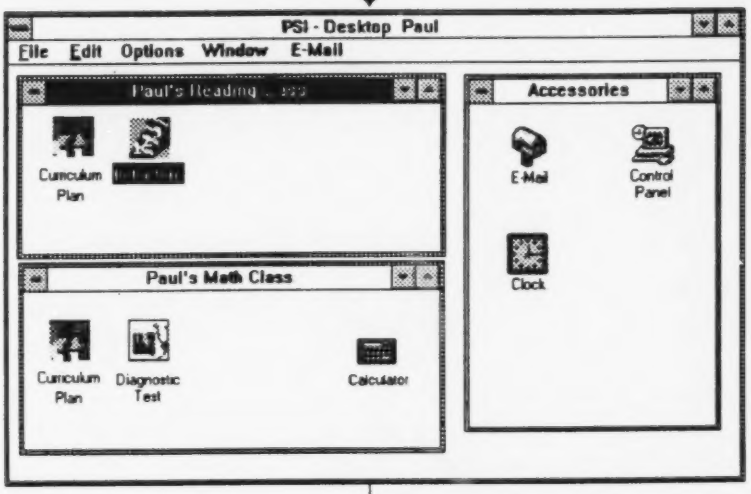
Figure 1b



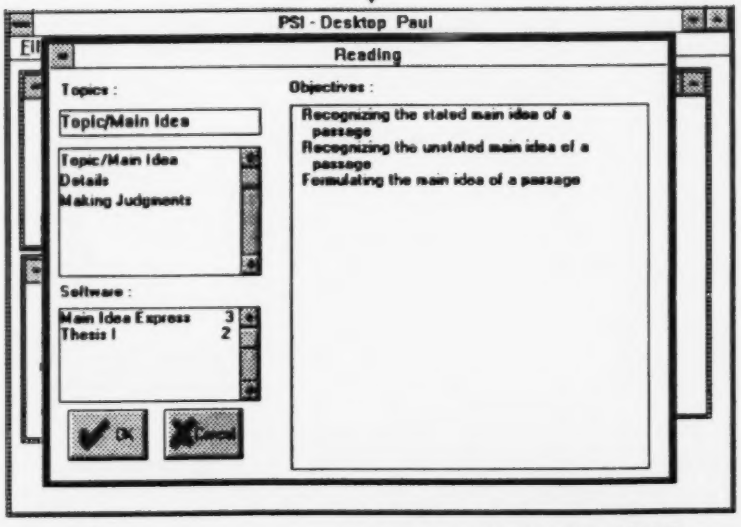
Paul sees his desktop for the first time and he has E-mail waiting for him.



Paul has read his E-mail and has taken the diagnostic test for Reading. His desktop now shows an Instructions icon.



Paul has double-clicked the Instructions icon.



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PSI Command Module (PCM). PSI will respond to instructors and their assistants through its *Command Module* in such a way that they feel they are at the center of the system. PSI accomplishes this goal by obtaining faculty preferences as to how *each* faculty member wishes to use the system. The options available include, among others, designating a course to be multidiscipline or not, selecting a placement and/or diagnostic test, specifying the instructional software to be used or letting PSI use all available software, specifying the conditions under which PSI should alert the faculty about students' lack of progress, and selecting the type of student reports. In addition, standard network maintenance functions such as backup and restore, installation of software, adding and deleting users are accomplished through PCM. Other maintenance functions include generating reports, modifying the PSI databases, and updating the questions in the computerized testbank.

After the students are registered in PSI, the faculty member who so chooses can add or delete students in his/her course; access student records, either singly or in groups; access students' *Curriculum Plan(s)* to see progress; get various reports, either on-line or in print; send E-mail messages to co-workers or students; and create or modify *Curriculum Plan(s)*. In particular, the instructor can intervene personally in the learning process for any of his/her students.

Software Connectivity Module (SCM). A unique feature of PSI is the software Connectivity Module, which provides a common *connectivity mechanism* to communicate with multi-vendor software so that they can all be managed by PSI. PSI initiates the software for the student, passes data to the software, gets data back from the software, and maintains bookmarks. The SCM is also designed to allow for the collection of data about the usefulness/effectiveness of the software in the real world. This data will allow the project team to make improvements in the automated operation of the system to create the *Curriculum Plan(s)*.

In developing PSI, we aim to do for education what IBM did for the PC industry and what Microsoft did for PC applications. If we look back, we see that the PC market was floundering and moving at a snail's pace until IBM established the *de facto* open architecture standard for PC hardware, and soon after, we witnessed a big boom in the PC hardware industry. Similarly, the programming industry was floundering and moving at a snail's pace until Microsoft established the open architecture for Common User Access (CUA) in Windows for the programming environment. The fully implemented CUA led to a boom in PC applications. Following in the footsteps of these two trends, we predict that PSI will give a boom to the adoption of instructional software in educational institutions because of its open architecture standard for user as well as software interfaces. By Miami-Dade's taking on this horrendous task of developing PSI, software publishers stand to gain because we provide a **platform of neutrality** on which all of us can come together and work toward a common goal.

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SOFTWARE IMPLEMENTATION MODEL

The Software Implementation Model used in Project SYNERGY consists of five stages as represented in Figure 2.

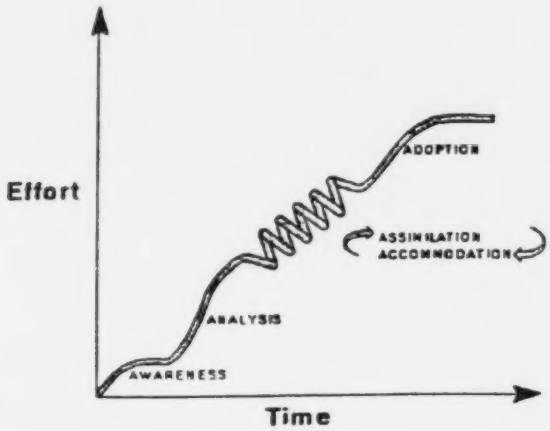

Figure 2. Software Implementation Model

During the awareness stage, faculty hear about software in conferences or read about it in journal articles and publicity materials.

In the analysis stage, faculty need to spend an appreciable amount of time examining the software, reading manuals and literature, talking to users, and discussing the possible ways to use it and how to assess its usefulness. Educational institutions have mostly ignored this stage and the time it takes for faculty to understand how the software works and how best to integrate it in their courses. Project SYNERGY's recommendation is that the LAN during this stage should be open only to faculty so that they can explore the software in detail.

The accommodation and assimilation stages are intertwined. In the accommodation stage, faculty begin to use the software with little or no change in what they do by way of teaching. Software is seen as an "add-on." In the assimilation stage, faculty begin to realize that what they do by way of teaching could change, and should change, in order to enhance the benefits of using technology. Also, faculty recognize that institutional support is required to alter some of the traditional practices in order to integrate technology more fully with teaching and learning. After several iterations of the accommodation - assimilation cycle, the use of technology becomes operational during the adoption stage.

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The five stages in implementation — awareness, analysis, accommodation, assimilation, and adoption — do require time and effort as shown in Figure 2. The transition from accommodation to assimilation presents the greatest challenge as it represents the integration of technology with teaching and learning from a cognitive perspective. It needs a great deal of collaborative effort and departmental support. The iterative nature of the accommodation-assimilation cycle does permit faculty to take steps small enough to insure their personal success and comfort while they refine their implementation strategies.

Based on their own degree of commitment and/or their institutional environment, some faculty follow through the stages while others drop out; some move through the stages faster than others. The underlying ingredients for those who succeed in full implementation are a *personal* purpose and a *personal* commitment to use technology. Meaningful and enduring uses of software emerge from an internal frame of reference operating for each faculty member. Giving faculty the time and encouragement to explore the software from their personal perspectives sets the stage for them to engage in self-evaluation and to identify ways to improve how they teach and how they use the software. We found this to be true among our faculty, some looking *inwardly* more so than others.

FACULTY DEVELOPMENT

Faculty development in the context of technology in general and PSI in particular should aim to help faculty shift their focus from an instructional model to a learning model, from group instruction to individualized instruction, and from being providers of information to being facilitators of learning. In order to help them make this shift in focus, faculty development should include programs on how people learn, individualizing the curriculum, and facilitating learning; provision for exploration of instructional software and discussion on how best to incorporate it in the curriculum; workshops on the use of productivity tools such as statistical packages, wordprocessing, grade books, spreadsheets, authoring tools; assistance in designing research studies to determine the impact of software on student performance; and workshops on strategic and tactical approaches for working toward long-range plans while contending with short-term solutions.

Faculty development is an ongoing process that progresses in a spiral fashion as faculty develop a better understanding of their own strengths, their students' needs, and the potentials of technology to help them meet their students' needs. Integrating technology into the curriculum calls for some dramatic changes on the part of faculty, and, therefore, they need support from a person who is empathic with their role shift rather than a technological wizard who may have

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less appreciation for the teacher's role. This individual has to help faculty understand the importance of an internal frame of reference for integrating technology in the teaching/learning process in order to make the changes enduring and personally meaningful.

RESEARCH

Research is considered integral to software implementation. Without a commitment to research, the educational institutions and the software industry are likely to reach a plateau, if they haven't already, in the use and production of software. Research will help faculty refine their ways of implementing software and publishers refine the ways the software works. This refinement is not going to take place overnight but rather over repeated trials as represented by the upward spiral in the Software Implementation Model.

What makes research more appealing to the faculty is conducting it in the context of formative evaluation. Formative evaluation allows faculty to acknowledge the fact that they do not know how best to integrate the software with their teaching to get the best results for each student and accept the need to keep on refining their ways until satisfactory outcomes are attained. Stated differently, Project SYNERGY research methodology consists of an *internal frame of reference* for faculty to engage in research to determine the *most effective combination of human and technological resources* that will yield the greatest benefit to each student. In our approach to software implementation, research is presented as an instrument of change and not as a litmus test of good or bad teaching.

Generally speaking, people have great expectations of what technology can do and should do. Anything short of their expectations is blamed on the technology. The task of designing the uses of software for teaching and learning is neither simple nor small. It takes place within the context of an institutional environment and is influenced by a variety of factors, including how familiar faculty are with the software, how they design its uses, who the students are, and how the students respond to the software. Consequently, one should not be disappointed if dramatic improvements are not observed in the beginning. Rather, one should focus on what did happen and what the implications are for future implementations. In our case, the Software Implementation Model did not enjoy the same degree of success among the faculty. The dangers of quitting too soon because the results are not positive and/or settling down to a routine when the results are not convincing are real dangers in action research.

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INSTITUTIONAL ENVIRONMENT

Our work with faculty and administrators in implementing software and conducting research has drawn attention to many other factors that facilitate or debilitate the use of technology on a campus. We have coined the expression *Project* SYNERGY *Environment* (PSE) to represent these factors. Environment embraces *physical, social* and *cultural aspects* that an institution should endeavor to provide in order to maximize the benefits of PSI. Physical aspects include *space, hardware, software, location, security,* and *safety;* social aspects deal with *personnel and the interrelationships among them;* cultural aspects expect the institutions to *examine their traditional practices* (budget allocation, class size, number of contact hours, beginning and end of terms) and modify them in order to enhance the efficiency and effectiveness of PSI.

In undertaking to develop PSI and promote its adoption, we realize that we have to embark on a new direction, a *paradigm shift*. In this paradigm shift, educators must go beyond Mission Statements and exhibit a passion for accountability. We must be accountable in terms of reducing student dropout rates and increasing student success rates. We must orchestrate the use of human and technological resources to do the right things and do them well. We should not hesitate to question our traditional practices to determine whether or not they have a role in this paradigm shift, and if they do, in what form. We should recognize that a substantial and enduring solution to a serious, nagging problem will require concerted and collaborative effort over an appreciable period of time. We should acknowledge that the solution is intertwined with technology, but embracing technology depends on the institution's priority, its willingness to put its resources into its priority, its awareness of its own political and social environment, and its belief in grassroots involvement. We should also acknowledge that devoting intensive and extensive attention to one targeted area such as the college-prep program for a stipulated time period is likely to yield greater results for an institution than dividing its resources among all its departments.

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